Solutions

Name: _____ score: _____ / 10

Instructions: There are 10 points possible on this quiz. No aids (book, notes, etc.) are permitted. You may use a non-programmable calculator. **Show all work and supporting calculations for full credit. Explain how you get your answers.**

1. *(3 pts)* The table shows the preference schedule for an election with three candidates (A, B, and C).

1pt a. Find the winner using the Plurality method.

$$\frac{A}{18} \quad \frac{B}{0} \quad \frac{C}{22} \qquad \boxed{C \text{ wins}}$$

Number of Voters	18	12	10
1st	A	C	C
2nd	B	B	A
3rd	C	A	B

2 pts b. Find the winner using the Borda count method.

A $3(18) + 1(12) + 2(10) \longrightarrow 54 + 12 + 20 = 86$ $\boxed{A \text{ wins}}$

B $2(18) + 2(12) + 1(10) \longrightarrow 36 + 24 + 10 = 70$

C $1(18) + 3(12) + 3(10) \longrightarrow 18 + 36 + 30 = 84$

2. *(4 pts)* The table shows the preference schedule for an election with three candidates (A, B, and C).

1pt a. Does a candidate have a majority of first place votes?

$V = 13 + 24 + 35$ $\frac{72}{2} = 36$ **37 for a majority**

$V = 72$ **No one has a majority.**

Number of Voters	13	24	35
1st	B	C	A
2nd	C	B	B
3rd	A	A	C

2 pts b. Find the Instant Run-off Voting (IRV) method winner.

$$\frac{A}{35} \quad \frac{B}{13} \quad \frac{C}{24} \quad \text{B is out}$$
$$ \qquad \quad \frac{13}{37}$$
$$\overline{35} \qquad \quad 37$$

C has a majority, so C wins.

new preference schedule

	13	24	35
1st	C	C	A
2nd	A	A	C

1pt c. The table to the right applies Copeland's method and shows that in head-to-head comparisons, B is the most preferred candidate.

Copeland's method analysis			
match-up	A (35) vs B (37)	A (35) vs C (37)	B (48) v. C (24)
winner	B wins	C wins	B wins

Does the IRV method violate the Condorcet criterion in this election? Explain.

Yes. B is the Condorcet candidate, so should be the winner. IRV found a different winner.

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Weighted Voting

3. *(3 pts)* Consider the weighted voting system [24: 11, 9, 5, 2].

$$[q: w_1, w_2, w_3, w_4]$$

1pt a. What is the meaning of the number 24?

24 is the quota of this weighted voting system.

1pt b. What is the meaning of the number 11?

Player 1, P_1, has a weight of 11 votes.

1pt c. Do Players 1, 2 and 3, $\{P_1, P_2, P_3\}$, form a winning coalition?

yes. Add the weights and the total is greater than the quota.

$11 + 9 + 5 = 25$

$25 > 24$
(the quota)